Parallelized Calculation of PI

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***Abstract*—The abstract goes here.**

I. Introduction

The parallelized calculation of PI has been chosen to compare different parallel computing technologies by benchmarking the calculation of PI. Thus a short program has been written meeting the special requirements of the technologies. Notably these technologies are the MPICH2 implementation of the message passing interface (MPI), the Threads library from the new C++11 standard and OpenMP API from the OpenMP consortium.
All these standards allow inter process/thread communication which is a crucial requirement to parallelize tasks on modern multi core computer systems. Though all technologies use different approaches.
The MPI is a standardized communication protocol which applies the concept of message passing to communicate between processes. They may be running on the same or on different systems connected by a network. In comparison to the other technologies briefly introduced below, it works on processes and not on threads. The MPI implementation MPIChameleon 2 (MPICH2) released by the Argonne National Laboratory has been used for the benchmarks in this paper.
The latest version of the C++ standard C++11 released in late 2011 supports parallelization by multithreaded programming. The C++11 standard library provides a thread class which takes a function object to start a new thread. The concept for inter thread communication is synchronization. In order to compile the PI calculation program gcc tool chain has been set up.
The third used technology is the OpenMP API. It makes it possible to parallelize threads by preprocessor directives. The trusted communication concept for the threads is to use shared memory. The same random access memory (RAM) area can be accessed by different threads at the same time.

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II. Methods

The description of methods goes here.

III. Empirical Results

The empirical results are going here.

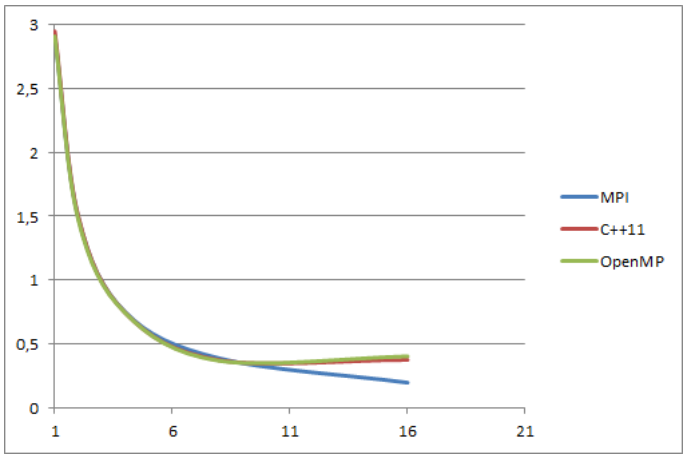

Fig. 1. Benchmark for 100000000 rectangles.

IV. Conclusion

The conclusion goes here.

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References

[1] H. Kopka and P. W. Daly, *A Guide to LaTeX*, 3rd ed. Harlow, England: Addison-Wesley, 1999.